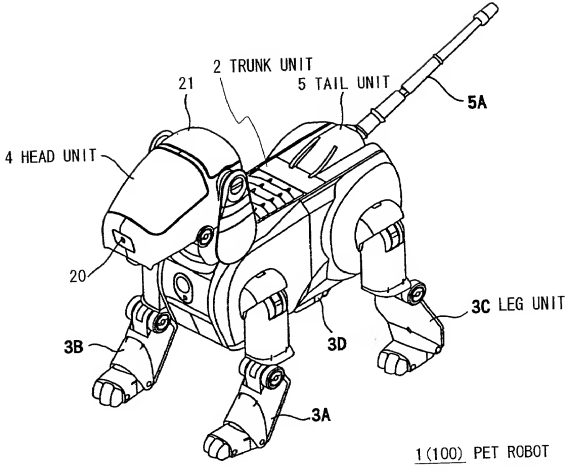

2 TRUNK UNIT
21
5 TAIL UNIT
5A
4 HEAD UNIT
20
3C LEG UNIT
3B
3D
3A
1(100) PET ROBOT

FIG. 1

FIG. 2

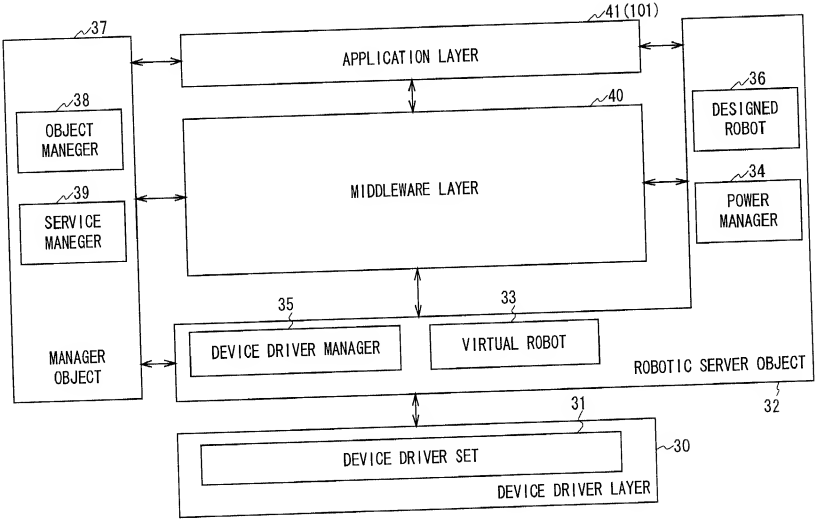


FIG. 3

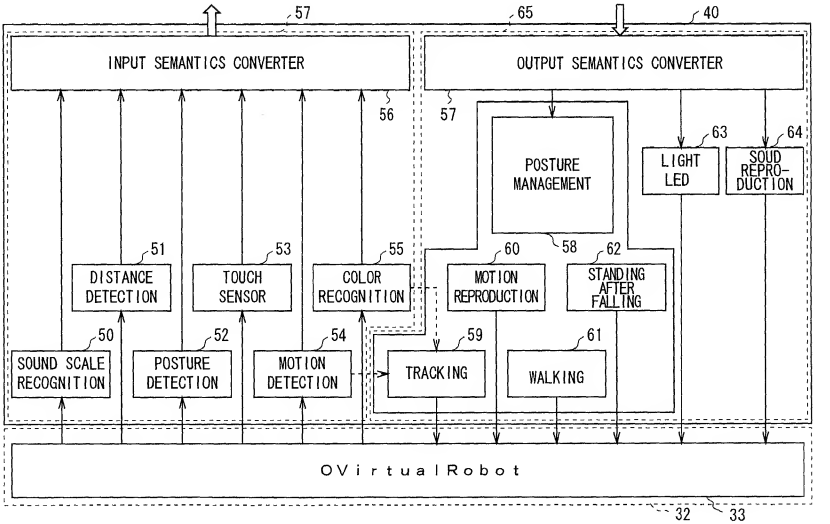


FIG. 4

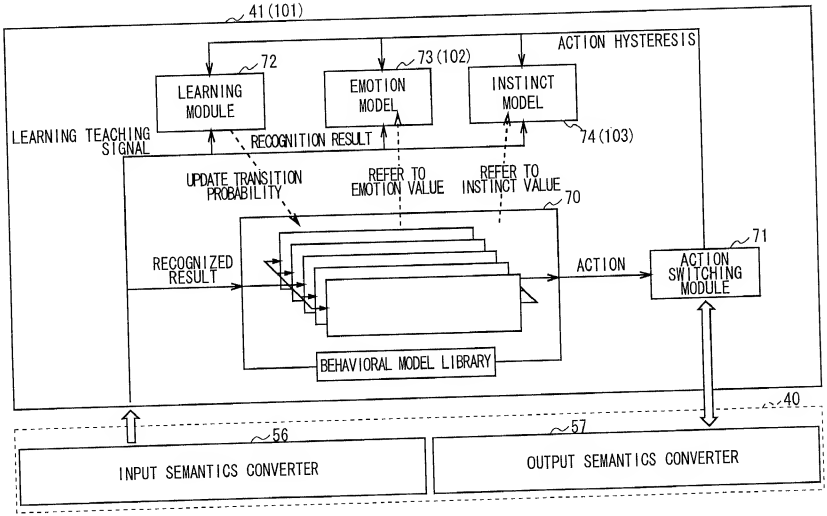

41(101)
ACTION HYSTERESIS
72
73(102)
LEARNING MODULE
EMOTION MODEL
INSTINCT MODEL
74(103)
LEARNING TEACHING SIGNAL
RECOGNITION RESULT
UPDATE TRANSITION PROBABILITY
REFER TO EMOTION VALUE
REFER TO INSTINCT VALUE
70
RECOGNIZED RESULT
ACTION
71
ACTION SWITCHING MODULE
BEHAVIORAL MODEL LIBRARY
40
56
57
INPUT SEMANTICS CONVERTER
OUTPUT SEMANTICS CONVERTER

FIG. 5

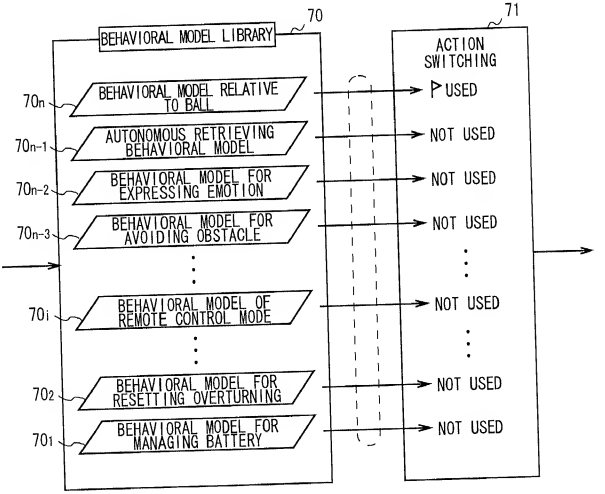

70
71
BEHAVIORAL MODEL LIBRARY
ACTION SWITCHING
70n
BEHAVIORAL MODEL RELATIVE TO BALL
USED
70n-1
AUTONOMOUS RETRIEVING BEHAVIORAL MODEL
NOT USED
70n-2
BEHAVIORAL MODEL FOR EXPRESSING EMOTION
NOT USED
70n-3
BEHAVIORAL MODEL FOR AVOIDING OBSTACLE
NOT USED
70i
BEHAVIORAL MODEL OF REMOTE CONTROL MODE
NOT USED
702
BEHAVIORAL MODEL FOR RESETTING OVERTURNING
NOT USED
701
BEHAVIORAL MODEL FOR MANAGING BATTERY
NOT USED

FIG. 6

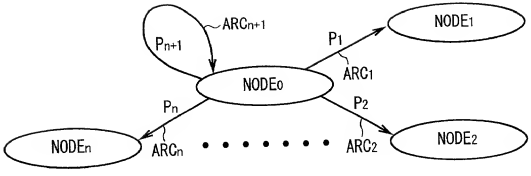

ARCn+1
Pn+1
NODE1
P1
ARC1
NODE0
Pn
P2
NODEn
ARCn
ARC2
NODE2

FIG. 7

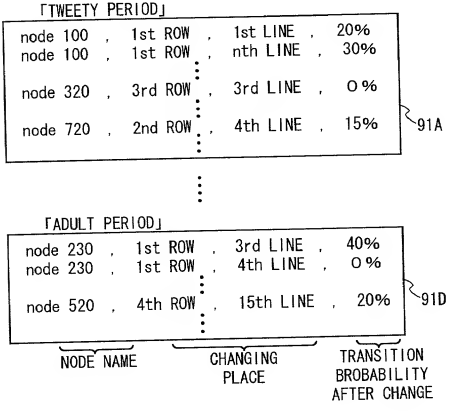

「TWEETY PERIOD」
node 100 , 1st ROW , 1st LINE , 20%
node 100 , 1st ROW , nth LINE , 30%
node 320 , 3rd ROW , 3rd LINE , 0%
node 720 , 2nd ROW , 4th LINE , 15%
91A
「ADULT PERIOD」
node 230 , 1st ROW , 3rd LINE , 40%
node 230 , 1st ROW , 4th LINE , 0%
node 520 , 4th ROW , 15th LINE , 20%
91D
NODE NAME
CHANGING PLACE
TRANSITION BROBABILITY AFTER CHANGE

FIG. 12

	INPUT EVENT NAME	DATA NAME	RANGE OF DATA	TRANSITION PROBABILITY TO ANOTHER NODE				
	node 100			A	B	C	D	n
TRANSITION TARGET NODE				node 120	node120	node 1000		node 600
OUTPUT ACTION				ACTION 1	ACTION 2	MOVE BACK		ACTION 4
1	BALL	SIZE	0, 1000	30%				
2	PAT				40%			
3	HIT				20%			
4	MOTION					50%		
5	OBSTACLE	DISTANCE	0, 100			100%		
6		JOY	50, 100					
7		SUPRISE	50, 100					
8		SADNESS	50, 100					

80

FIG. 8

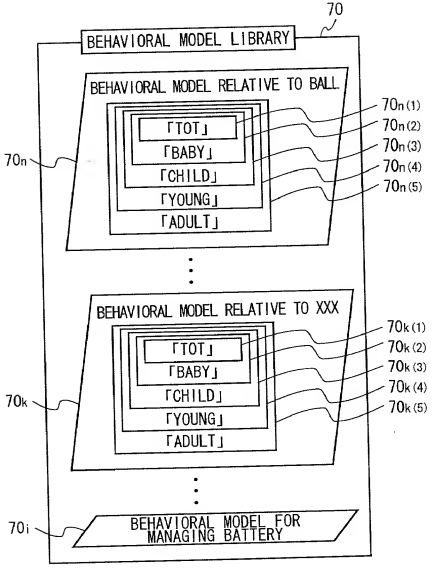

70
BEHAVIORAL MODEL LIBRARY
BEHAVIORAL MODEL RELATIVE TO BALL
「TOT」
「BABY」
「CHILD」
「YOUNG」
「ADULT」
70n
70n(1)
70n(2)
70n(3)
70n(4)
70n(5)
BEHAVIORAL MODEL RELATIVE TO XXX
70k
70k(1)
70k(2)
70k(3)
70k(4)
70k(5)
70i
BEHAVIORAL MODEL FOR MANAGING BATTERY

FIG. 9

FIG. 10

FIG. 11

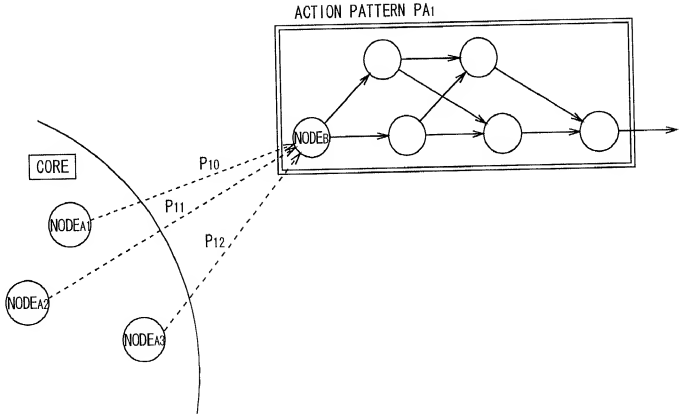


FIG. 13

FIG. 14

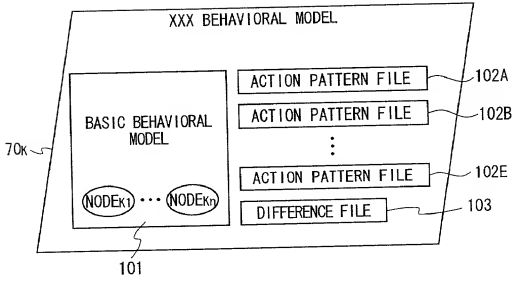

XXX BEHAVIORAL MODEL
ACTION PATTERN FILE
102A
ACTION PATTERN FILE
102B
BASIC BEHAVIORAL MODEL
70K
ACTION PATTERN FILE
102E
(NODEK1) ··· (NODEKn)
DIFFERENCE FILE
103
101

FIG. 15

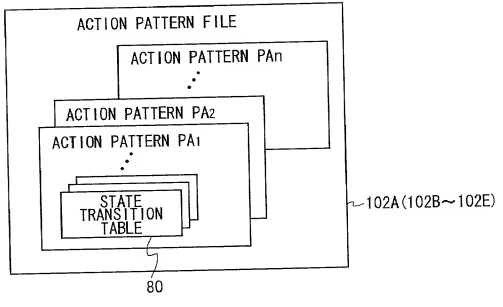

ACTION PATTERN FILE
ACTION PATTERN PAn
ACTION PATTERN PA2
ACTION PATTERN PA1
STATE TRANSITION TABLE
102A(102B~102E)
80

FIG. 16

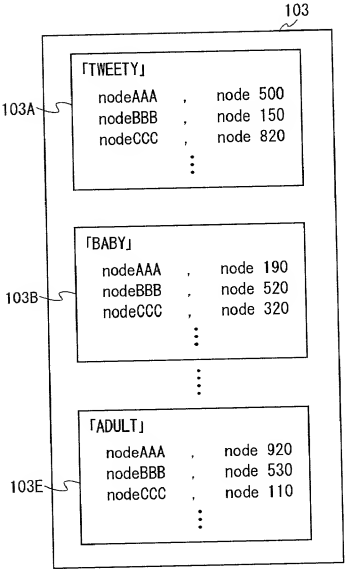

103
「TWEETY」
nodeAAA , node 500
nodeBBB , node 150
nodeCCC , node 820
103A
「BABY」
nodeAAA , node 190
nodeBBB , node 520
nodeCCC , node 320
103B
「ADULT」
nodeAAA , node 920
nodeBBB , node 530
nodeCCC , node 110
103E

FIG. 17

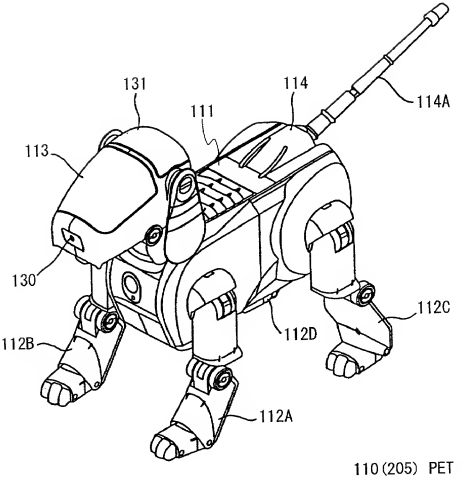


FIG. 18

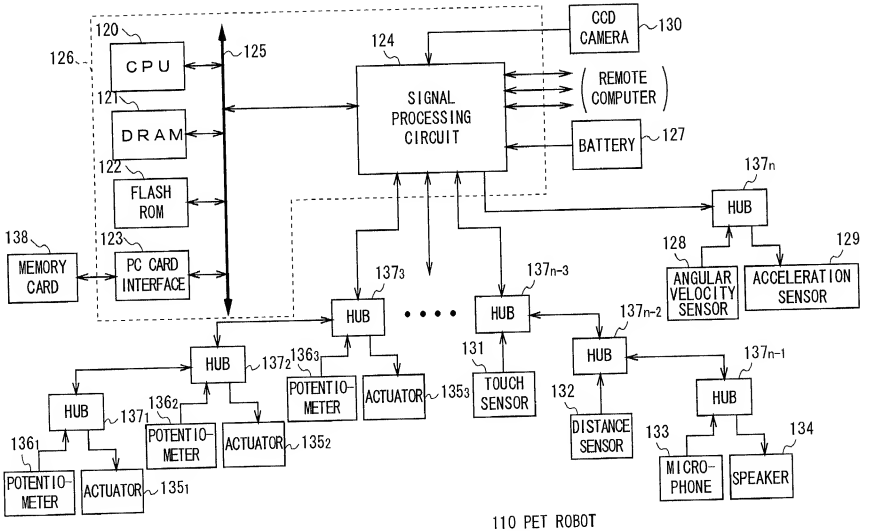

120
CPU
126
125
121
DRAM
122
FLASH ROM
123
PC CARD INTERFACE
138
MEMORY CARD
124
SIGNAL PROCESSING CIRCUIT
CCD CAMERA
130
REMOTE COMPUTER
BATTERY
127
137n
HUB
128
ANGULAR VELOCITY SENSOR
129
ACCELERATION SENSOR
137n-3
137n-2
137n-1
137₃
HUB
HUB
HUB
HUB
HUB
1372
1363
POTENTIO-METER
ACTUATOR
1353
131
TOUCH SENSOR
132
DISTANCE SENSOR
133
MICRO-PHONE
134
SPEAKER
1362
1371
POTENTIO-METER
ACTUATOR
1352
1361
POTENTIO-METER
ACTUATOR
1351
110 PET ROBOT

FIG. 19

FIG. 20

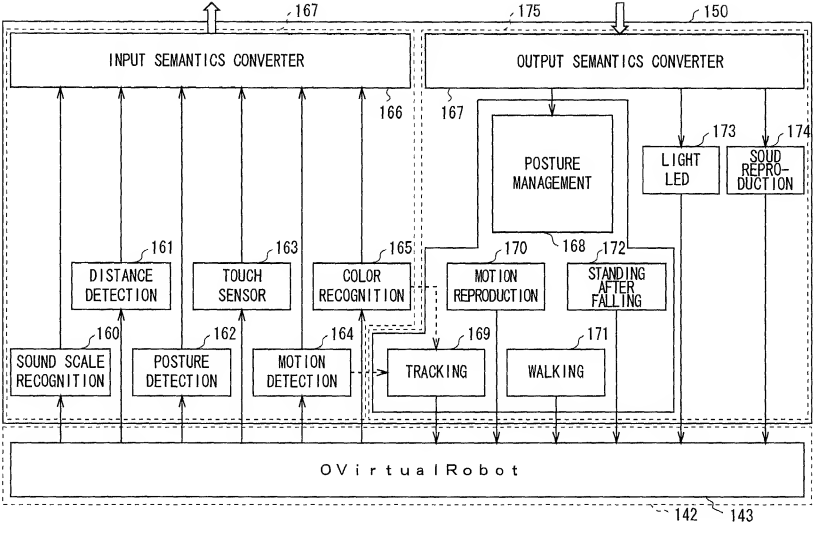


FIG. 21

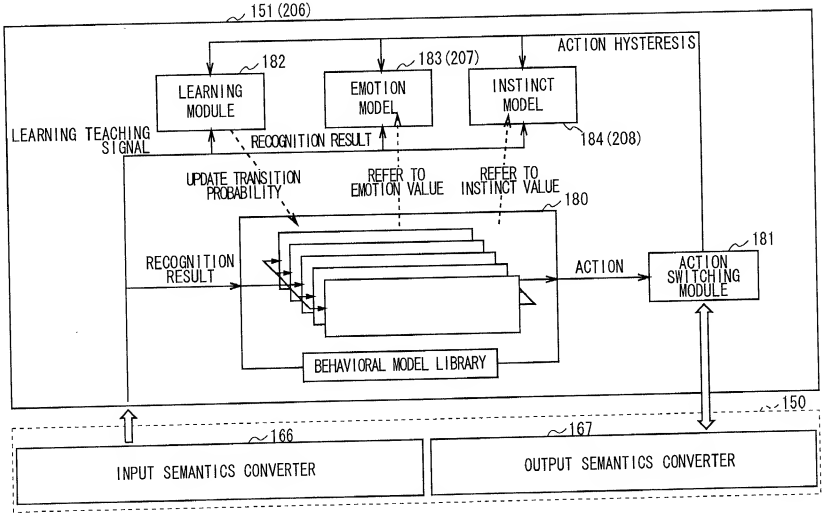

151 (206)
ACTION HYSTERESIS
182
183 (207)
LEARNING MODULE
EMOTION MODEL
INSTINCT MODEL
184 (208)
LEARNING TEACHING SIGNAL
RECOGNITION RESULT
UPDATE TRANSITION PROBABILITY
REFER TO EMOTION VALUE
REFER TO INSTINCT VALUE
180
181
RECOGNITION RESULT
ACTION
ACTION SWITCHING MODULE
BEHAVIORAL MODEL LIBRARY
150
166
167
INPUT SEMANTICS CONVERTER
OUTPUT SEMANTICS CONVERTER

FIG. 22

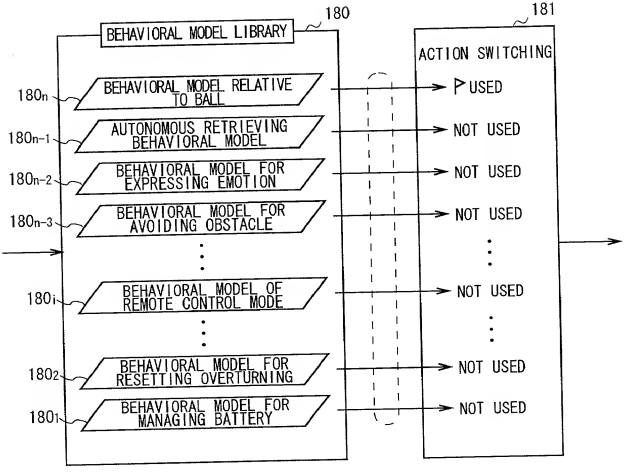

180
BEHAVIORAL MODEL LIBRARY
181
ACTION SWITCHING
180n
BEHAVIORAL MODEL RELATIVE TO BALL
USED
180n-1
AUTONOMOUS RETRIEVING BEHAVIORAL MODEL
NOT USED
180n-2
BEHAVIORAL MODEL FOR EXPRESSING EMOTION
NOT USED
180n-3
BEHAVIORAL MODEL FOR AVOIDING OBSTACLE
NOT USED
180i
BEHAVIORAL MODEL OF REMOTE CONTROL MODE
NOT USED
1802
BEHAVIORAL MODEL FOR RESETTING OVERTURNING
NOT USED
1801
BEHAVIORAL MODEL FOR MANAGING BATTERY
NOT USED

FIG. 23

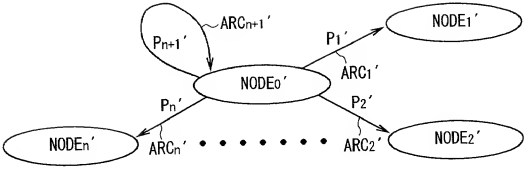


FIG. 24

	INPUT EVENT NAME	DATA NAME	RANGE OF DATA	TRANSITION PROBABILITY TO ANOTHER NODE Di				
	node 100			A	B	C	D	n
TRANSITION TARGET NODE				node 120	node120	node 1000		node 600
OUTPUT ACTION				ACTION 1	ACTION 2	MOVE BACK		ACTION 4
1	BALL	SIZE	0.1000	30%				
2	PAT				40%			
3	HIT				20%			
4	MOTION					50%		
5	OBSTACLE	DISTANCE	0.100			100%		
6		JOY	50.100					
7		SUPRISE	50.100					
8		SADNESS	50.100					

190

FIG. 25

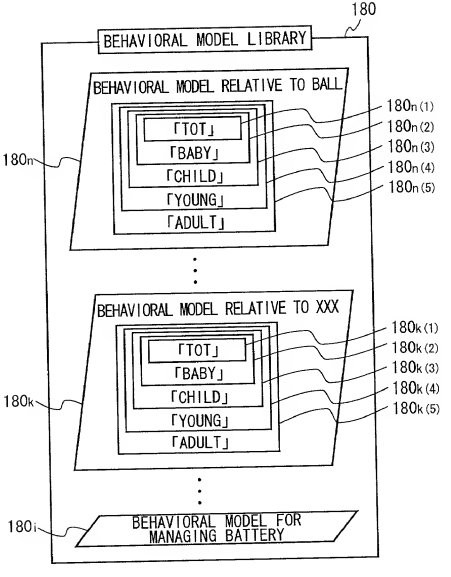


FIG. 26

FIG. 27

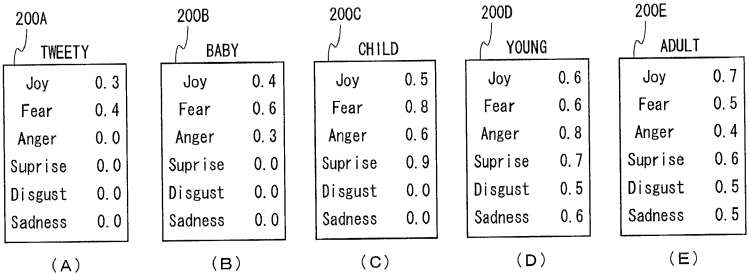


FIG. 28

09/890231

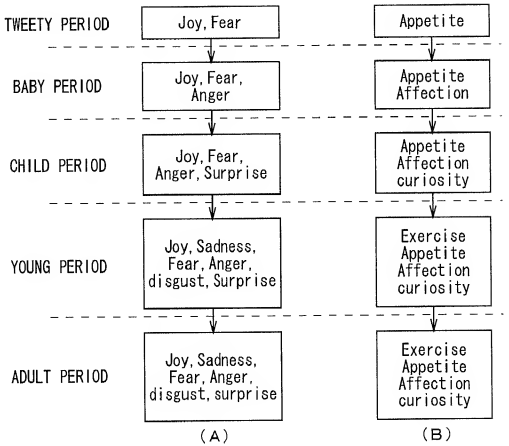


FIG. 29

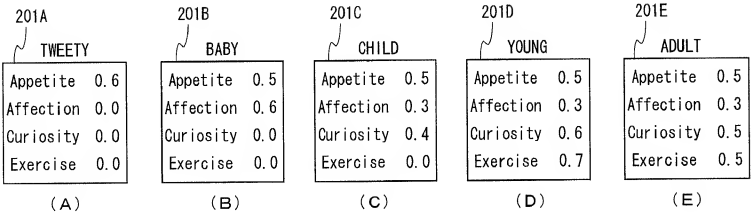


FIG. 30

09/890231

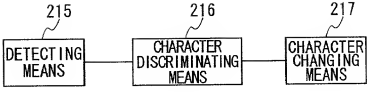


FIG. 31

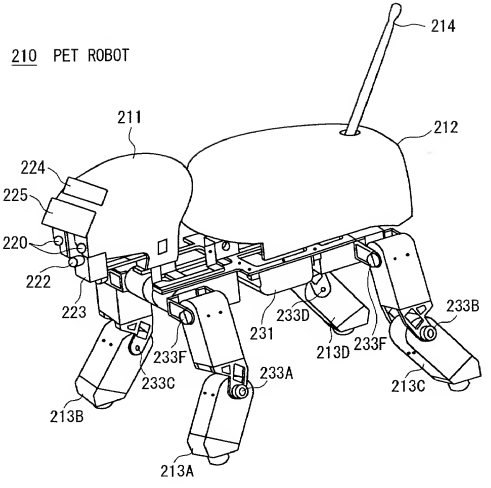


FIG. 32

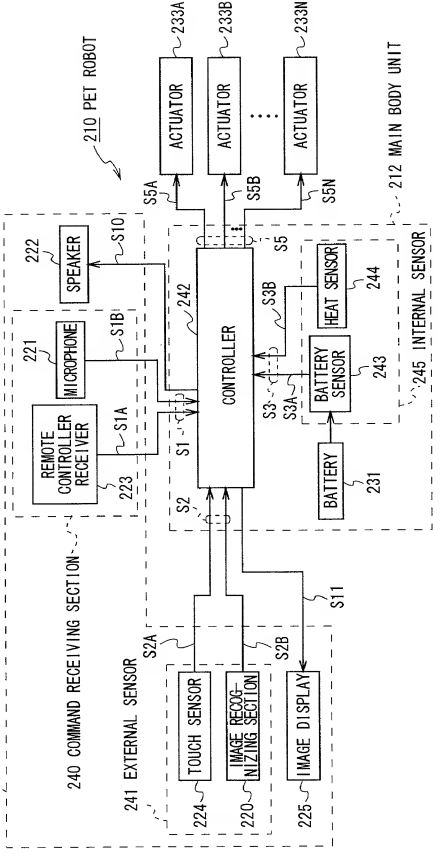


FIG. 33

FIG. 34

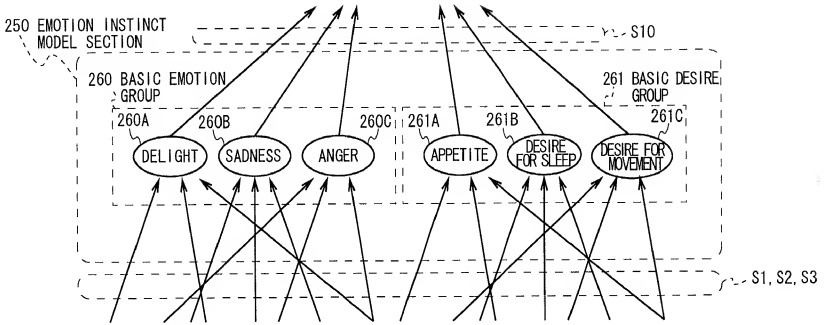


FIG. 35

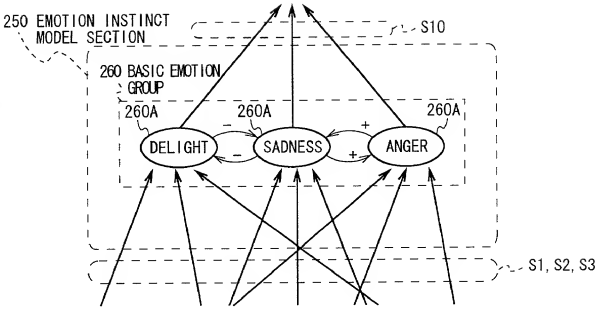

250 EMOTION INSTINCT MODEL SECTION
S10
260 BASIC EMOTION GROUP
260A
260A
260A
DELIGHT
SADNESS
ANGER
S1, S2, S3

FIG. 36

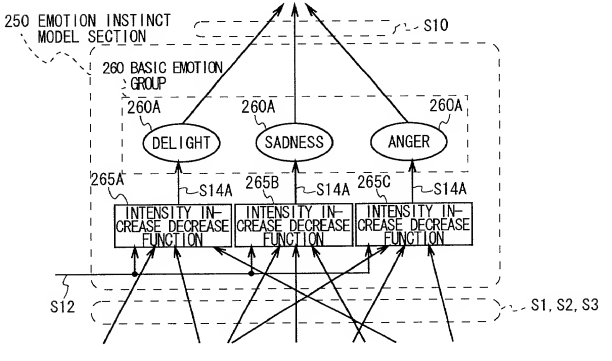

250 EMOTION INSTINCT MODEL SECTION
S10
260 BASIC EMOTION GROUP
260A
260A
260A
DELIGHT
SADNESS
ANGER
265A
S14A
265B
S14A
265C
S14A
INTENSITY INCREASE DECREASE FUNCTION
INTENSITY INCREASE DECREASE FUNCTION
INTENSITY INCREASE DECREASE FUNCTION
S12
S1, S2, S3

FIG. 37

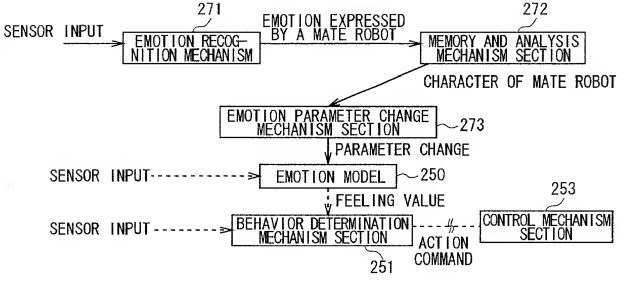

271
SENSOR INPUT
EMOTION RECOG-NITION MECHANISM
EMOTION EXPRESSED BY A MATE ROBOT
272
MEMORY AND ANALYSIS MECHANISM SECTION
CHARACTER OF MATE ROBOT
EMOTION PARAMETER CHANGE MECHANISM SECTION
273
PARAMETER CHANGE
SENSOR INPUT
EMOTION MODEL
250
FEELING VALUE
253
SENSOR INPUT
BEHAVIOR DETERMINATION MECHANISM SECTION
CONTROL MECHANISM SECTION
ACTION COMMAND
251

FIG. 38

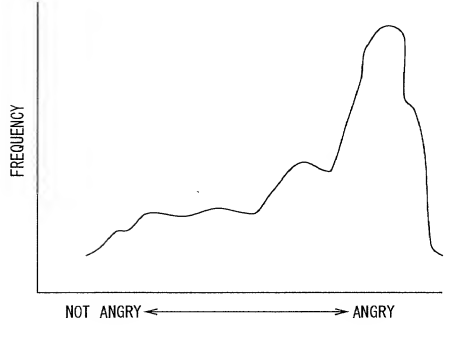

FREQUENCY
NOT ANGRY
ANGRY

FIG. 39

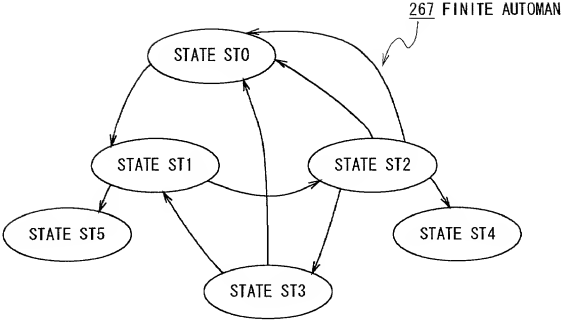


FIG. 40

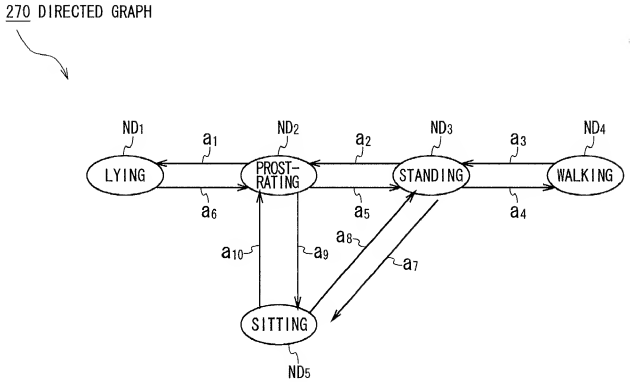


FIG. 41

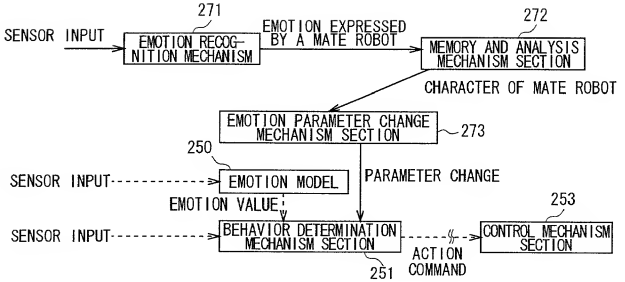

271
SENSOR INPUT
EMOTION RECOG-NITION MECHANISM
EMOTION EXPRESSED BY A MATE ROBOT
272
MEMORY AND ANALYSIS MECHANISM SECTION
CHARACTER OF MATE ROBOT
EMOTION PARAMETER CHANGE MECHANISM SECTION
273
250
SENSOR INPUT
EMOTION MODEL
PARAMETER CHANGE
EMOTION VALUE
253
SENSOR INPUT
BEHAVIOR DETERMINATION MECHANISM SECTION
CONTROL MECHANISM SECTION
ACTION COMMAND
251

FIG. 42

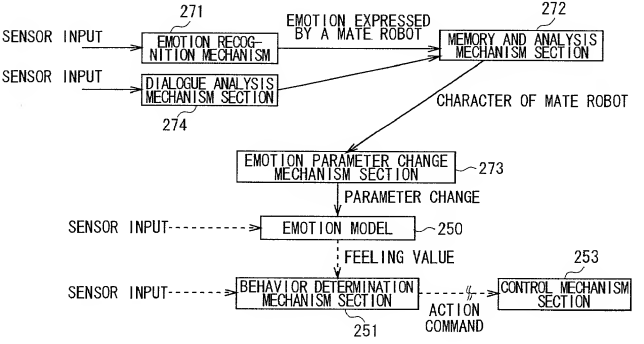
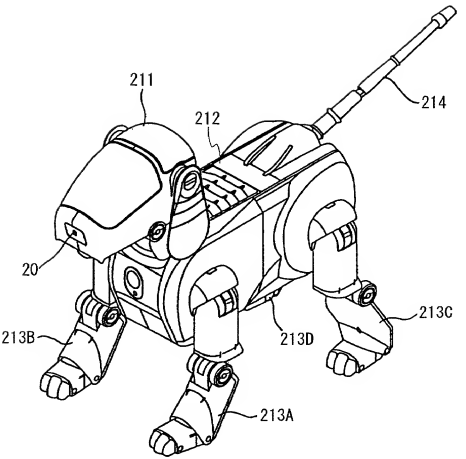

271
SENSOR INPUT
EMOTION RECOG-NITION MECHANISM
EMOTION EXPRESSED BY A MATE ROBOT
272
MEMORY AND ANALYSIS MECHANISM SECTION
SENSOR INPUT
DIALOGUE ANALYSIS MECHANISM SECTION
274
CHARACTER OF MATE ROBOT
EMOTION PARAMETER CHANGE MECHANISM SECTION
273
PARAMETER CHANGE
SENSOR INPUT
EMOTION MODEL
250
FEELING VALUE
253
SENSOR INPUT
BEHAVIOR DETERMINATION MECHANISM SECTION
CONTROL MECHANISM SECTION
ACTION COMMAND
251

FIG. 43



210 PET ROBOT

FIG. 44

Explanation of Reference Numerals

1, 100, 110, 205, 210...pet robot, 10, 120, 242...CPU, 16, 126...control unit, 33, 143...virtual robot, 40, 150...middleware layer, 41, 151, 206...application layer, 70, 180...behavioral model library, 70_1 to 70_n, 70_k, $70_{k(1)}$ to $70_{k(5)}$, 180_1 to 180_n, 180_k, $180_{k(1)}$ to $180_{k(5)}$, $180_{n(1)}$ to $180_{n(5)}$ ...behavioral model, 91A to 91D, 103...difference file, 101...basic behavioral model, 102A to 102E...action pattern file, PA_1 to PA_n...action pattern, $NODE_{K1}$ to $NODE_{Kn}$...virtual node, 200A to 200E...emotion parameter file, 201A to 201E...instinct parameter file, 72, 182...learning module, 73, 102, 183, 207...emotion model, 74, 103, 184, 208...instinct model, k_e to k_i...coefficient, 215...detecting means, 216...character discriminating means, 217...character changing means, 270...emotion recognition mechanism section, 271...memory and analysis mechanism section, 273...emotion parameter change mechanism section, 274...dialogue analysis mechanism section.